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ABSTRACT

A school district's 15 years of involvement with the computer are recounted in this paper, from the first computer literacy course to the present slackening of interest in the subject. The conclusion, however, is that computer technology will not be shelved, but will continue to change the way society lives and maximize student development. As an example of this, the district attempted to take the busy work out of education with a computer program that can perform statistical data analysis for secondary science course experiments, thus leaving more time for discussion and analysis of information. (DCS)

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EVOLUTION OF CURRICULUM.....

BEFORE, INTO, AND BEYOND

COMPUTER LITERACY

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EVOLUTION OF CURRICULUM...
BEFORE, INTO, AND BEYOND COMPUTER LITERACY

Education as an institution has a tendency toward trying new things, working with the concept or tool for awhile, and then gradually reverting back to the way it was done before. Very often the event involves massive expenditures of dollars, is usually supported by a generous federal program, and involves a short term training plan with respect to staff and any future personnel involved in the initiation of the activities or curriculum. The task becomes dominated by a few and avoided by many until the philosophy, good or bad, is discarded. The same may be said for our present initiatives in the curriculum often referred to as Computer Literacy. High technology was thrust on education at a time when it was being decimated by one report after another stating how education was not providing the services to society that were required. Dollar infusions were the answer and it was essential for everyone to become computer literate.

Everyone used the terms but no one seemed to know exactly what was expected from this exploding program. Society, Board members, parents, students, everyone demanded services in computer education. All desired immediate insight into the world of programming, the secrets of BASIC, the manipulation of data. New terms CPU, CRT. Bits, Bytes, K, micro, mainframe became common place. A computer world required that those in the "know" had to use these terms to demonstrate their prowess and up-to-date knowledge. Those in education who determined this to be another passing fad that would gradually fade away as other "innovations" of the past, took a passive role in this overwhelming phenomena, and waited for the inevitable to occur.

Now the dust has begun to settle. The time has come for this nasty perturbance in our community to gather dust and be shelved. The question is-will it? Students are beginning to think "why should I know this stuff?" when taking a course in FORTRAN. "This is boring!", "How will this help me?", "I'm not going to be a programmer", are statements that are now beginning to be heard. Enrollments in courses dealing with the structure of computer language are beginning to level off. Is the end in sight? We think not. The technology seems to be here to stay and the need to live with that technology and to work with its ever changing requirements is a reality that we will be experiencing from now on.

It is for this reason that we thought we might be able to provide some insights as to how one school district has been working with the technology.

Our romance with the computer began approximately 15 years ago. One of our math teachers at the high school taught FORTRAN to 15 students. Cards were keypunched and then hand-carried to Rutgers University for processing.

Our first computer literacy course utilized a PDP 8 and two terminals. The instructor, borrowed from the math department, taught one section of 15 students and instructed them in BASIC. We gradually upgraded to a PDP 11 and 6 terminals. BASIC, FORTRAN and C were taught to 50 students. The instructor continued to be part time from the math department and the cost of the program rested with the math department budget. At this point in time, a terminal was attached to the PDP 11 system from

the science department (physics). Students and staff were slowly integrating the system into specialized software used to enhance our PSSC and Project Physics curriculum.

To orient us in time, these events all occurred by 1979. Our major expansion was just beginning. We started at one of the junior high schools and structured the curriculum for introduction to BASIC to grade 9 physical science students. We utilized an HP 3000 mainframe purchased by the Board for administrative purposes,and 1 CRT with a built-in printer. Our student to teacher ratio was 30 to 1. Instruction required that each student produce a working program by the end of the quarter. We estimated that the average student spent 5 to 10 minutes per week on the computer. Most work therefore, was designed for students to complete at their desks. When they were at the terminal, they only had sufficient time to put their program on and save it for future reference and application.

Expansion placed a second terminal in the classroom and added the program and one terminal to the second junior high's course. Training of staff was on the job. Key personnel were selected and provided with manuals, materials and assistance that was requested. Additional staff was then trained by fellow staff members. Difficulties encountered were many. We were generally working in the unknown, with computer hardware that was more business then educationally oriented. We ultimately developed sufficient skill that we totally ignored any commercially prepared software and became totally dependent on the

materials that we were capable of creating ourselves. The value in doing this is that we were not forced to create a curriculum or course of study simply because it was in a prepared program. Our direction rested solely with our level of capability, our desired direction for the program, and most importantly, what we perceived as being the specific level of our students.

The lessons our staff learned about curriculum, strangely enough, rested not with computers, but with a program we had created called Basic Skills. Analysis of test results had suggested that students had considerable difficulty in solving word problems in math, but when working with similarly developed word problems in science, the difficulties seemed to diminish and the success rate in problem solving was greatly enhanced. Further study indicated that the learning process in science created a less abstract reasoning base and thereby allowed the student an opportunity to more easily visualize the problems' information base.

The Basic Skills lab we created had three levels of difficulty, with each level having content designed for the particular needs of the group. Since the group's comprehension varied from year to year, the curriculum topic maintained a general expectation, but the methodology and problems varied considerably. The result was a constantly modifying format and curriculum that created great flexibility in staff development and versatility.

In working with the computer it was our decision to zero into this group of students and to use the computer as a vehicle to teach basic skills and organized problem solving. We, therefore, set up a program where we instructed the students in BASIC using the HP 3000. Our target grades were seventh and eighth.

As the computer literacy craze began to become an overwhelming force in our schools, we as a district, focused conscientiously at this point on our students' educational pattern. The Basic Skills vehicle became our computer literacy base and the future curriculum in computer literacy evolved from our desire to maximize our students' ability to problem-solve.

Our committee of citizens, Board members, Assistant Superintendent of Curriculum, math and science supervisors, systems manager, Board Secretary and computer staff began a 12-month study of how best to initiate the program. Finalized steps created a 25 unit computer center in each of our two junior high schools. The course began in the second half of the grade 7 and continued through the first half of the grade 8. The emphasis was computer utilization as a problem solving-tool, and we structured around the previously determined patterns formulated in the year prior to the addition of the computers. Flexibility is still of great importance. The methodology, however, is definite and standard. The computer's format allows for little flexibility. We purchased "Apples" as our micro-computer. Each functions with a separate disc drive, with three terminals affiliated with printers. Staff was provided with workshop

time to familiarize themselves with the systems. In actuality, education was again on the job with each center depending on the computer expertise of one individual. Communication between the staff of both centers was expected and regular meetings and planning times were added to all staff schedules.

The rumble was now becoming a roar. Parents were demanding computers throughout the school's curricula. Our expenditures to this point had been about $300,000. The active participation of the Board members and interested residents had created an outside force that generated considerable impact on our direction. We scraped our HS PDP 11 and the board voted to purchase a Data General 8000 and 60 terminals for 3 labs. Our original offerings using one lab on the PDP 11, one lab on the HP 3000, and one lab of Apples had been BASIC, C, FORTRAN and COBOL to about 200 students. With the DG 8000 we could offer BASIC, advanced BASIC, Pascal, C, COBOL and Introduction to Data Processing to over 400 students each semester. Our staff requirements included 3 full time instructors in each junior high school and 3 full time and 6 part-time instructors in the high school. The board approved a full-time department chairperson to oversee the program.

The residual hardware from the HP then became a part of the secondary science program. Each pair of rooms was direct line-wired to the HP 3000 situated at the Board Office. Patterns were set up so that the science facilities in the 3 secondary schools were linked. A statistical data analysis software

package was purchased so that experimental data gathered through student experimentation could be computerized and analyzed by section, school, district, etc. Graphic display of evidence provided the student with a hardcopy display of data which could then be analyzed and discussed.

Word processing also was generated at this time. Using state grants and mandates, programs were established through the business department to instruct students in the procedures involved.

Integrated programs from adult education, special education, and handicapped, adult residents of the community were incorporated into the plan. Training of staff maximized the use of training personnel from Data General, etc.; however, the bulk of training was staff-developed and presented. On-the-job training and workshops became an operational must.

As a last point, residue Apple microcomputers left over from the high school modification were then distributed (1 per school to each of our 8 elementary schools). Total additional expenditures were estimated at $350,000.

It's all in place. The dust has settled. The demand is beginning to subside. Enrollment in computer language programming has leveled off and seems to be in a slight decline. The elementary micro-utilization is sporadic with minimal numbers of staff participation in any computer related activities. The science program has been having technical difficulties in making the software packages do what we want them to do. A teacher's

strike turns the district into turmoil. The time seems right for the classical shelving of the ideas and returning to the basics-that non-defined, ambiguous term that all educators and politicians frequently use when anxiety, challenge and/or threat seem to be coming too close to the foundation of the established institution. But this time there seems to be a difference! The computer, as conforming and dogmatic as its operational patterns are, has begun to generate a new freedom. The students are freest of all! The adult world has difficulty in keeping up with the ability of its students to effectively utilize the new technology. The word processor on the home micro organizes a student's paper. Software such as "Spellstar" indicates spelling errors. The electronic dictionary notifies the user of the error but doesn't correct it. Graphics begin to minimize some of the busy work a teacher might use to finish off a week's worth of lessons. The spark generates many of the associated adults as well. New pioneers occur every time a workshop is held. Once bitten, the pioneer begins to go beyond the original study. Explanation becomes the mode. New things are tried. Flexibility becomes acceptable. The challenge becomes new educational opportunities. Modification and change, by necessity, are more palatable. The future for education and the computer looks promising.

The future - Where can we go? What can be done? We can only speculate. We do know that now is the time to analyze what we have and to do some fine-tuning of the programs. This

should not be confused with a move to create a stage of status quo. Since what we have is an evolution based on the premise of improving problem-solving skills, the premise now includes the computer as a problem solving tool. Why do we write computer programs? To solve problems!! A few changes may be needed at the junior high to include the use of more application software. At the high school more noticeable changes will need to be made. A few increased offerings can be made in the area of program, such as AP Pascal, RPG, or more advanced BASIC. But the biggest changes will need to be made in the area of applications. Such thing as spreadsheets, data bases, data analysis, computerized accounting, computerized music and art need to be considered seriously. Communications, uses of bigger data bases, library searches, robotics, internship for consulting and repairs are all possible and needed for the promotion of the problem-solving skill development that was started less than 15 years ago.

The computer can be a highly effective education tool. It's mechanical, it will only do what it's directed to do. The magic rests in the capability of the humans involved in the task.

If we were to anticipate the direction of need, it would be that we as a country will probably be most successful in the computerization of communication. Through word processing,

teleconferencing, etc., we already have the capability of doing this. Our voracious appetite for the written and interpretive word will lead us down a path potentially glutted with reams and reams of paper. Perhaps for nothing else than to save our forests, the computer can meet our needs and do so effectively and in a greatly enhanced environment. Word processing speaks for itself; it has the ability to organize a document, structure its paragraphs, correct spelling, and thus give order to a world constantly criticized for these major areas of concern.

Calculations or data analysis (the ability to develop and use mathematical formula and statistically apply it to the analyzation of a problem or system) is a basic weakness espoused by almost all educators.

You will note that somewhere toward the beginning of this paper we discussed a Basic Skills lab program that was ultimately disbanded because the parents, students and administrative portions of the institution of human learning felt that it was not essential for all.

Let's assume they were correct. If so, the need to spend hours taking spelling tests, diagramming sentences, doing the hours of ditto sheets of addition, subtraction, etc. would not be a part of the memory clutter we place in a growing mind. What if we let the machine handle this basic learning? The question might become "What will we do with all that extra class time?" What would happen if the busy work was taken out of

education? We have no intention of trying to answer those questions directly. However, in science we are attempting to provide a small step in developing some of the potential answers to the situation.

When one analyzes a secondary science course, one generally finds that there is a considerable amount of teacher lecture and demonstration. However, what one continually reads is that the student learns best by doing, that the "hands on" experience will ultimately generate a maximum amount of success.

Using this as a point at which to begin, we are designing a program in which we will use a user friendly statistical software package called "Minitab" to statistically and graphically analyze experimental data. The experiments being designed by staff are such that the students will be able to generate experimental data that can be graphed and charted. The data will be placed into the computer by groups and by experiment. Every group of students in the course throughout the district will have input into the data base. When formatted, the total compilation of information can then be comparatively analyzed to the results of the group, class section, school, etc. The time originally spent calculating etc. can now be used for discussion and analysis of information. The dialogue can then extend beyond the experiment. More efficient data analysis provides the base to develop these steps that might be taken to determine the validity of extrapolated evidence and hypothetical results.

The process is only a small step in the infancy of a new era of high technology. We can fear and/or reject the unknown, or we can accept the potential of modification and maximize student development in the uncharted directions of the future. The choice is ours.